Bicycle Boulevard Guidance

Introduction

Bicycle boulevards are low-volume and low-speed streets that have been optimized for bicycle travel through treatments such as traffic calming and traffic reduction, signage and pavement markings, and intersection crossing treatments. Bicycle boulevards have been implemented in cities across the country, including Columbia (MD), Minneapolis, Berkeley, Seattle and Portland. Bicycle boulevards are garnering more attention as cities look to strategies for attracting more people that are "curious, but cautious" about riding their bicycles in an urban context. Bicycle boulevards allow bicyclists to avoid higher volume, higher speed roadways, offering a more comfortable and leisurely riding experience. For this reason, bicycle boulevards are more likely to attract families, and other more cautious or less confident bicyclists that are less likely to use bicycle facilities on roadways where interaction with higher vehicle volumes and speeds are likely. The primary characteristics of a bicycle boulevard are:

- low motor vehicle volumes
- low motor vehicle speeds
- logical and continuous routes that are well marked and/or signed
- convenient access routes to desired destinations (typically parallel routes to higher speed, higher volume arterial or collector streets)
- minimal bicyclist delay
- comfortable and safe crossings for cyclists at intersections

There are several resources available that provide a thorough introduction to the fundamentals of bicycle boulevards, addressing the planning, design, and maintenance of these facilities. These resources include:

> *Fundamentals of Bicycle Boulevard Planning and Design*, Portland State University and Alta Planning+Design, 2009.
>
> *Bicycle Boulevard Design Tools and Guidelines*, City of Berkeley, 2000.
>
> *Traffic Calming State of the Practice*, ITE, 1999, http://www.ite.org/traffic/tcdevices.asp
>
> *Traffic Calming: Roadway Design to Reduce Traffic Speeds and Volumes*, Victoria Transport Policy Institute, updated 12/26/11, http://www.vtpi.org/tdm/tdm4.htm

Because these resources provide a good background on bicycle boulevards, this section will not focus on the fundamentals of bicycle boulevards, but rather, on key steps in the planning process, how bicycle boulevards might work in the Wichita context, and the specific design considerations that are most applicable to Wichita.

Bicycle Boulevards in Wichita

Bicycle boulevards have the potential to play an important role in Wichita's bicycle network. Wichita has an extensive path network that is the backbone of Wichita's bicycle network. A primary objective of this

Master Plan is to extend that network by supplementing pathsvia an on-street bicycling network. Bicycle boulevards are an important type of on-street bicycle facility for extending the network, because the types of riders that are attracted to paths will feel comfortable using bicycle boulevards that are properly designed.

There are several areas in the city where it is possible to connect pathsby way of a bicycle boulevard, which could significantly expand the reach of the bicycle network. Additionally, there are high volume, high speed arterial roadways in Wichita where on-street bicycle facilities are not feasible due to right-of-way and/or funding constraints. Developing bicycle boulevard facilities parallel to these streets is an ideal solution for expanding the bicycle network into these areas of the city.

Bicycle boulevards have the potential to provide a high return on investment because they tend to attract a wide range of bicyclists and can address additional neighborhood goals such as traffic calming, green streets, storm-water management, etc. that other bicycle facility improvements do not provide. The cost of construction will vary depending on the specific traffic calming and intersection treatments implemented. For example, new pedestrian signals will be needed as some major arterial crossings.

Recommended Bicycle Boulevards

The Master Plan recommends approximately 122 miles of bicycle boulevards. The bicycle boulevard network is comprised of three typologies listed below.

- On-street connections between paths
- Residential on-street bicycle boulevards
- Mixed-facility bicycle boulevards (route a combination of bicycle boulevards, bike lanes and shared lane markings; most common)

The following are selected examples of the three typologies. They are represented on the Early Implentation Map and are recommended in the list of early implementation projects (see page __)

Connections between existing paths

9th St--this east/west route provides a residential street connection between the side path on Zoo Blvd and the Arkansas River Bicycle Path. This is the only missing link in the trail system that extends from downtown west to 119th St.

Wassall St – this east/west bicycle boulevard connects between the Arkansas River Bicycle Path and the Gypsum Creek Bicycle Path. It would also provide a connection to the pedestrian/bicycle bridge crossing of 135.

Residential street bicycle boulevards

Piatt Ave—this corridor provides a north-south route parallel to Grove St and a the Canal Bike Trail between 2nd Ave and 21st St. The route serves as a residential street connection on the east side of I-135.

25th St/Green St/Estelle Ave/2nd Ave/Volutsia Ave/Kellogg Dr/Chautauqua Ave—this north-south route serves as a residential street route between the K-96Pathand Lincoln St through Uptown, East Front and Sunnyside neighborhoods. The route provides a connection across 400/54 using a bicycle and pedestrian

bridge. The route connects residents to the businesses on E Douglas Ave and E Central Ave. It also provides north south access to the Atwater Neighborhood City Hall, Lynette Woodard Recreation Center, and an elementary school.

N Keith St//N Belwood St/W Sterling St/N Keith St/W 20th St N West/Westfield Cir/W Westlawn St/ N Keith St/N Westfield St/Murray St/W Harvest Ln/N Westlink Ave/Delano Ave/N Caddy/W Central Ave/N Maus/W Hardtner St/N Caddy/Tee Ln/Westfield St/Shad Ln/Fairway St to W 2nd St N—This north-south bicycle boulevard follows residential streets and connects neighborhoods in northwest Wichita.

N Shocker Drive/ N Fountain/Unnamed campus roadway/ Perimeter Rd/Belmont Ave/E 24th St N/N Fountain St/ Charron Ln/E Brooks St—this bicycle boulevard provides a residential street connection between the Redbud Bicycle Path, Wichita State University and the K-96 Bicycle Path.

Mixed-facility bicycle boulevards

Murdock Ave/Broadview Ave/8th St/Crestway Ave/9th St—This east-west bicycle boulevard extends east from the Central Riverside Park and connects the Canal Route (I-135) Bicycle Path, Wesley Medical Center, McDonald Park, Edgemoor Park, a library and two elementary schools. The route follows both arterial and residential streets with several facility types: bicycle boulevard, bike lanes and shared lane markings.

33rd St/Coolidge Ave/Woodrow St/20th St/N Porter St/N Perry Ave—This bicycle boulevard runs north-south through Benjamin Hills and North Riverside neighborhoods between the Big Arkansas River and the Big Ditch. It provides an extension of the existing Rosalie Bradley Path along the Little Arkansas River. The route consists of bicycle boulevard between 13th St and 18th St and shared lane markings between 18th and 33rd St.

Bicycle Boulevard Design Considerations

Traffic Volume and Speed

Prominent Markings Can Brand the Boulevard and Provide Wayfinding

There are a number of design considerations that should be made before implementing a bicycle boulevard, including how best to manage the speed and volume of motor vehicles and establish bicycle priority, how to minimize impacts to nearby residential streets, how to maintain reasonable access for emergency and service vehicles, how to guide bicyclists along the route and get them safely across arterial streets. Streets with existing low volumes (less than 1,000 ADT) are good bicycle boulevard candidates as they typically require minimal or no traffic diversion treatments. These streets may only require traffic calming measures to get speeds down to 20-25 MPH and increase the comfort and safety of bicyclists. Where traffic volumes exceed 1,000 ADT, traffic reduction measures should be considered where reasonable alternative routes exist for motorists in addition to traffic calming measures. Lastly, creating arterial street crossings that are accessible, safe, comfortable, and provide quality level of service are essential to a successful bicycle boulevard route.

Arterial Crossings

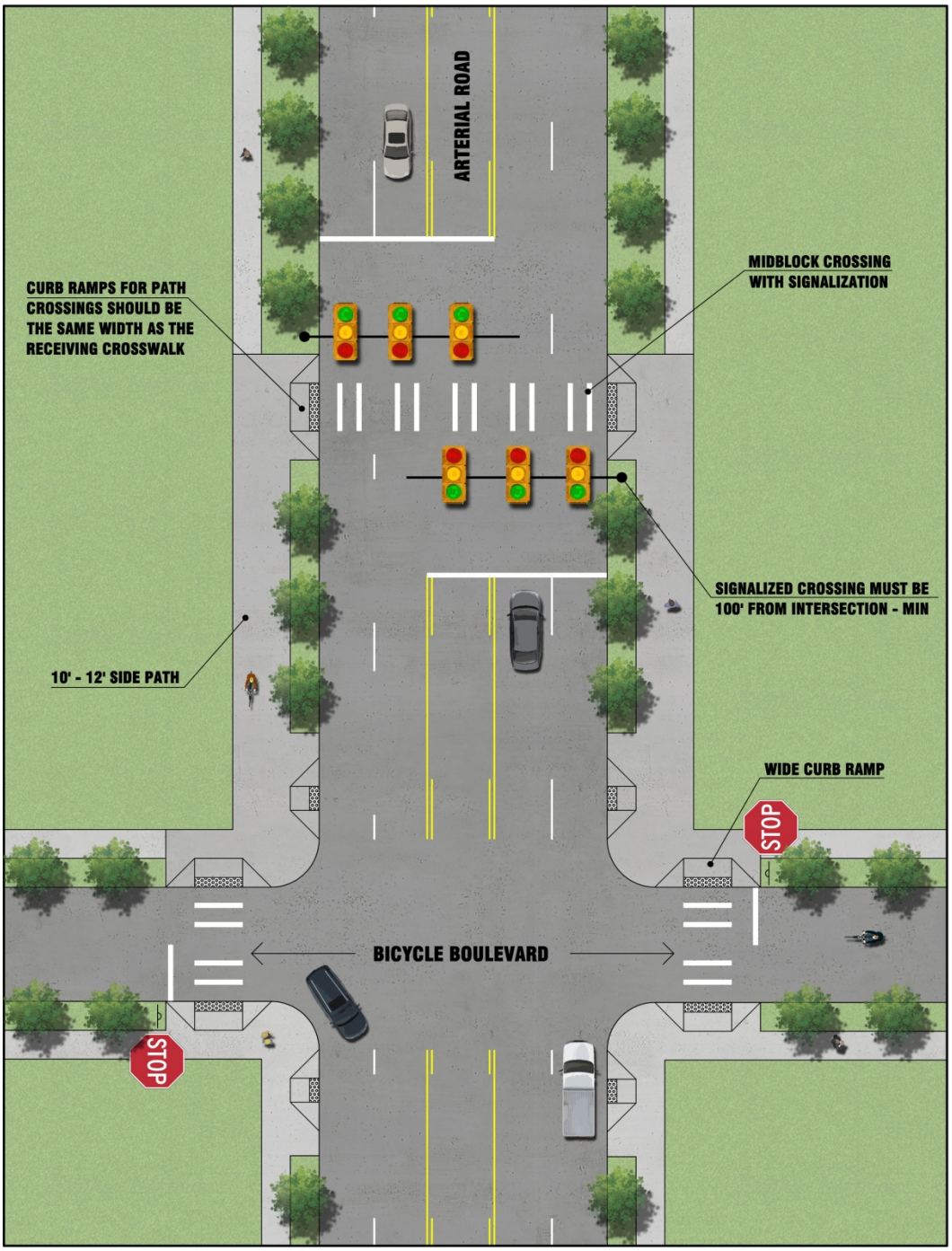
Bicycle boulevards, which most often are developed on low volume residential streets, most commonly intersect arterial roadways at unsignalized locations, however in some cases they may utilize existing signals, or require a new signal depending on motor vehicle traffic volume and posted speed limits, and the width of the roadway. It is essential for bicycle boulevard users to be able to cross arterial roadways safely and without substantial delay or inconvenience. While many intersection crossing treatments for bicyclists were originally based on pedestrian crossing treatments, special consideration should be given to the unique characteristics of cyclists, such as cyclist positioning, crossing times, and vehicle length. Crossing treatments should accommodate groups of cyclists and longer bikes, including tandems, cargo bikes and trailer bikes.

Wichita has installed numerous pedestrian signals throughout the city for facilitating pedestrian crossings of arterial roadways. Many of these pedestrian signals are classified as mid-block signals because they are located a minimum 100 feet away from the nearest stop or yield controlled side street intersecting the arterial (per MUTCD section 4F.02). Several recommended bicycle boulevards intersect with arterial roadways at locations where there are existing mid-block signals. Other recommended bicycle boulevards will require new mid-block signals where motor vehicle traffic volumes and speeds are high and the frequency of sufficient gaps for crossing the roadway is low. Key considerations for crossing locations where there are mid-block signals include:

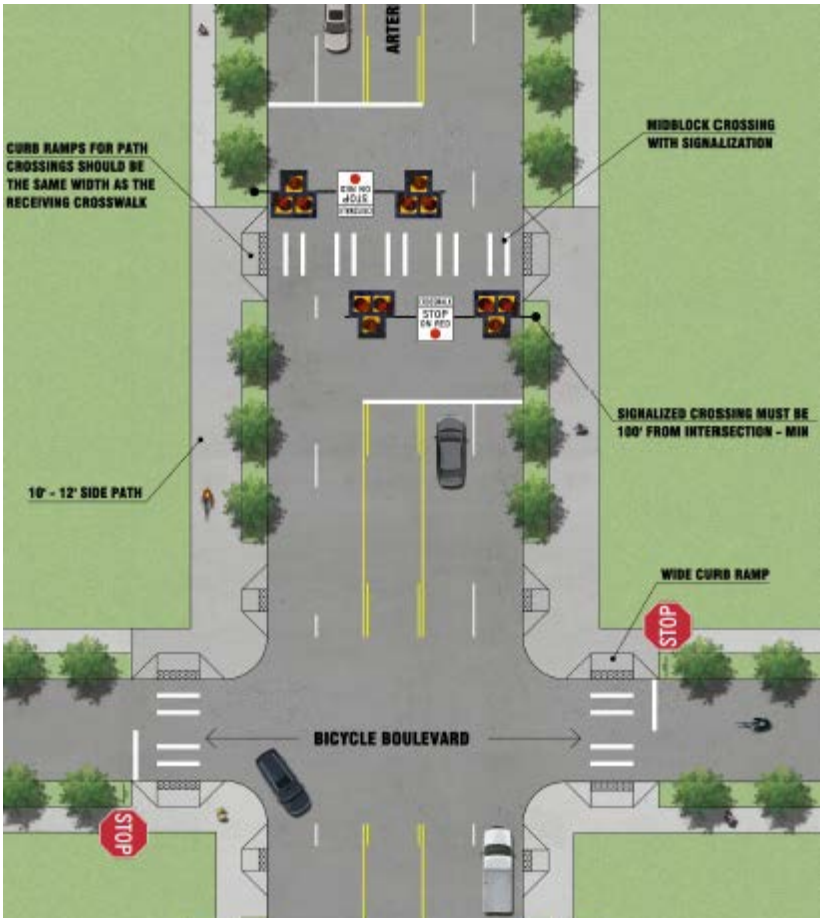
- Directing cyclists to the crossing location using signage and/or pavement markings and distinctive infrastructure, i.e. widened sidewalks or side paths connecting to crossing location
- Widening sidewalks that connect to crossing location to side path standard, where feasible. Sidewalks should be able to accommodate both pedestrians and bicyclists while minimizing

conflict between the two. In locations where there are high volumes of pedestrians using striping to separate bicycles from pedestrians should be considered.

- Transitioning from street to sidewalk. Where a cyclist is required to transition from the street to a sidewalk or side path (and vice versa) there is potential for conflict with motor vehicles, particularly turning vehicles. When needing to cross a lane of traffic in order to access the signal via sidewalk (from street), cyclists should be directed to make this transition using a two-step movement: first transition to sidewalk on right-side of street, then second, across crosswalk to opposite side of street where signal is located.
- Mid-block signals shall be used in conjunction with signs and pavement markings to warn and control traffic at locations where pedestrians/cyclists enter or cross a street (MUTCD).
- For guidance on Pedestrian Hybrid Beacons (HAWK signals) see MUTCD (2009 edition) Section 4f.01.



Title: Pedestrian Signal Recommended design for crosswalk with standard mid-block signal



Pedestrian Hybrid Beacon AKA "HAWK' (high intensity activated crosswalk. Recommended design for crosswalk with Pedestrian Hybrid Beacon (HAWK)

Bicycle Priority/Advantage

Design elements that prioritize travel on the bicycle boulevard are intended to raise awareness of the route as a bicycle priority thoroughfare and create conditions that reduce unnecessary delay for cyclists. Design treatments include pavement markings and wayfinding signage, adjustments to stop/yield control, and arterial crossing enhancements.

Example of Flipped Stop Sign With Custom Sign Branding the Boulevard

Employing distinctive symbols and/or colors to distinguish the bicycle boulevard from other roadway signs provides visual cues to motorists and cyclists that this is a different type of roadway. Supplementing wayfinding signage with pavement markings helps to further establish bicycle priority, and also encourages proper positioning by bicyclists while sharing the lane with motor vehicles. Unique bicycle boulevard pavement

markings such as “bike dots” or extra-large “bike blvd” lettering with bike symbol may be developed. Shared lane markings are being used more commonly in places like Portland and Seattle.

Because stop signs increase cycling time and energy expenditure due to frequent starting and stopping, they tend to result in non-compliance by cyclists. Bicyclists should be able to travel continuously for the entire length of the bicycle boulevard with a minimum of stops. Assigning stop or yield signs to control cross traffic is one way to minimize stops for bicyclists. Mini traffic circles may be an alternative to stop and yield controlled intersections. Parking may need to be removed near the intersection to improve sight distance of bicyclists and motorists approaching the intersection. After stop or yield signs are reoriented to cross streets to provide bicycle priority, an increase in motor vehicle volume or speed along the route may occur – this should be mitigated using traffic calming treatments.

A bike dot directs bicyclists at turns much like a trail of breadcrumbs

Traffic Calming Strategies on Local Streets and Collectors

There are numerous traffic calming treatments that may be integrated into a bicycle boulevard. Brief definitions are provided below for treatments which are likely to create the highest quality Bicycle Boulevards in Wichita – for more detailed information on each treatment, or to review additional treatments please refer to the resources cited below. NOTE: By means of an interdepartmental team involving members from Planning, Public Works, Police and Fire/Life Safety the city should revisit the existing traffic calming policy to better address Bicycle Boulevard implementation.

• **Mini traffic circles at 4-way intersections**- raised circular islands located in the center of intersections of local streets, intended to reduce speed of vehicles approaching the intersection while minimizing delay. Stop and yield signs may be eliminated when mini traffic circles are used. Signage indicating counter-clockwise circulation should be installed in advance and/or on the traffic circle.	
• **Mini traffic circles with Neckdowns at T-Intersection**. T-intersections require the use of smaller circles, limited parking restrictions within the circle, and approach neckdowns to deflect the movement across the top of the tee which otherwise could not be deflected by the circle.	
• **Chicanes** – raised curb features in the middle of the road (pedestrian refuge) or along the edge (chokers or curb extensions) that create horizontal shifting of travel lanes, which reduces vehicles speeds. Chicanes are typically used on long stretches of straight roadway and are ideal for approaches to signalized intersections where motorists may be inclined to accelerate towards the signal. A "chicaning" effect may also be achieved by alternating the location of on-street parking (on one side of the street) from one block to the next.	

• **Speed tables or raised crosswalk** - long and broad, flat-topped sections of raised roadway (3-4 inches high and 22 feet wide) that slow traffic by requiring motorists to reduce their speed. Speed tables are more comfortable than speed humps for bicyclists to ride over without reducing their speed. A 22 foot table has a motor vehicle design speed of 25 miles per hour.	
• **Speed cushions** – Similar in design to speed humps, speed cushions are rounded raised areas placed in the center of travel lanes to reduce vehicle speeds. They are generally 10 to 14 feet long (in the direction of travel) with. These are designed to allow free passage of larger chassis vehicles such as fire trucks through the flattened area.	
• **Speed humps** – Speed humps are rounded raised areas placed across the roadway to reduce vehicle speeds. They are generally 10 to 14 feet long (in the direction of travel). • **Speed humps with raised islands** are an effective combination on streets with low parking demand.	

Traffic Reduction Strategies

Traffic reduction design elements are intended to maintain existing low volumes or reduce the overall volume of motor vehicle through trips on the bicycle boulevard, while allowing continuous through travel by bicyclists and other non-motorized users. Impacts on nearby local streets and emergency response should be analyzed before implementing traffic reduction elements.

• **Partial Diverters** - restrict motor vehicle access while allowing bicycle and pedestrian access, typically restricting through movements or left turns. This type of treatment is typically placed on minor streets at an intersection with an arterial street to manage motor vehicle volumes on the minor street.	
• **Diagonal Diverters** – restrict through motor vehicle access completely at standard 4-way intersections while allowing bicycle and pedestrian access. This type of treatment is typically placed on minor streets at an intersection with an arterial street to manage motor vehicle volumes on the minor street.	
• **Median Closures** – restrict through motor vehicle access completely at standard 4-way intersections while allowing bicycle and pedestrian access requiring right in and right out motor vehicle movements. This type of treatment is typically placed on minor streets at an intersection with an arterial street to manage motor vehicle volumes on the minor street. This treatment can be used to facilitate bikes crossing the arterial or transitioning from the arterial to the bike boulevard.	

The above traffic calming and traffic reduction design elements have been in use in several communities for many years. However, concerns regarding traffic calming and reduction that occur on the bicycle boulevard are likely to be similar to concerns that are raised when these improvements are implemented anywhere else in the community. Most commonly, residents and officials will raise concerns about four potential issues related to traffic reduction and calming:

- Access to property;
- Impact on traffic patterns;
- Enforcement issues with motorcycles and mopeds; and

- Emergency response.

These are all legitimate concerns that need to be addressed, and can be addressed through a combination of good design and enforcement, if needed. It is important to keep in mind that eliminating or modifying traffic diversion and calming design elements that are part of a larger system may reduce their effectiveness. Poorly designed traffic diversion and calming elements on so-called bicycle boulevards may backfire creating new traffic problems, such as attracting through motor-vehicle traffic to a bicycle boulevard with fewer stops. This reduces the comfort and safety of cyclists, may negatively impact the neighborhood, and negatively influences opinions regarding the utility of bicycle boulevards in general.

To address each of these concerns it is important to involve stakeholders early. For residents living along a planned bicycle boulevard street, and concerned about accessing their property, presenting the design so that they can see how their access is affected is an important first step. Trial installations of design elements can alleviate resident concerns regarding access by allowing them to “try out” design features and allow any necessary modifications to be made before the city commits to a permanent installation. It is also very important during the initiation and conceptual planning phases to highlight the positive attributes of bicycle boulevards and the benefits residents can expect, including fewer cars on their street, fewer speeders, less noise, and generally, a more livable street.

When motor vehicle traffic is restricted or calmed on the bicycle boulevard it may induce an increase in motor vehicle traffic on adjacent streets. It is important to examine the impacts of traffic calming diversion elements both on the proposed bicycle boulevard and nearby streets, and include mitigation (e.g., additional traffic calming on adjacent streets) for any impact in their designs. Again, trial installations can allow residents to “try out” the design features and allow the city to evaluate and address impacts on traffic patterns.

Where traffic diversion is used, enforcing restrictions to motorcycles and mopeds may be needed. However, experiences in other communities have shown such violations to be seldom-it is likely that motorcyclists, like motorists, prefer to use the higher speed parallel streets when they are available nearby.

Traffic-calming elements can be a concern to fire and police personnel if the design substantially increases response times to properties along the bicycle boulevard. Having the support of the fire and police department is critical-without it development of a bicycle boulevard may be delayed or permanently deferred. Emergency services need to be engaged early in the planning process in order to identify acceptable design elements. Traffic reduction and calming design elements may be designed in such a way that allows a wide-chassis vehicle, such as a fire truck, to pass over, while preventing a similar movement of most passenger vehicles. Again, trial installations of street closures, medians, chicanes, or other design elements that may present an access concern to emergency services may be used to evaluate impacts on emergency responses.